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to Dr. *Halley's* Account of it, in the *Philosophical Transactions* (Numb. 183.) in which I entirely acquiesce, having always found it agreeable to the *Phænomena*.

If by publishing these Thoughts, I have explained the Rise of Vapours, in a more satisfactory Way than has been done before; or if I have only given useful Hints to others more capable of doing it, I have my End.

P. S. Since I have, for Brevity sake, only mentioned at what Heights from the Surface of the Earth, Vapours of different Densities will come to an *Æquilibrium*, without giving a Reason for settling the Place of *Æquilibrium*, at those Heights; I think proper to give the Method here by which they are to be found, *viz.* As the Vapours will settle and rise where the Air is of the same Density with themselves; it is only required to find the Density of the Air at any Distance from the Earth, at several Heights of the Barometer, which may be deduced from Dr. *Halley's* two Tables, *Philosoph. Transact.* Num. 386. (the First shewing the Altitude to given Heights of the Mercury, and the Second the Heights of the Mercury at given Altitudes) and knowing the Degree of Heat by the Thermometer, because the Density of the Vapour depends upon the Degree of Heat of the Season; provided that proper Allowances be made for the great Rarefaction of the Air near the Earth in hot and dry Weather, and the Condensation of the Vapours in their Rise, by reason of the Air being colder at a little Height above the Earth than just at the Surface of it.

IV. *An Account of some Observations relating to Natural History, made in a Journey to the Peak in Derbyshire, by Mr. J. Martyn, F. R. S.*

THE *Peak* in *Derbyshire*, having hitherto been described in scarce any other Light, than as a Place composed of Wonders; I was not a little desirous to make some Enquiry into the Nature of a Place generally esteemed one of the most Surprizing of our own Country.

In my Way thither, I took Notice of the following Plants, which I have not observed to be common

mon in other Parts of *England*, and are not taken Notice of by the Bishop of *London*, in his Edition of *Cambden*.

Stachys Fuchsi, J. B. In the Road to *Grantham*, a little beyond *Colefworth*.

Scrophularia Scorodoniæ, folio Mor. At *Wollerton*, under the Garden-wall. This does not owe its Origine in this Place to Seeds, scattered out of the Garden; as I am convinced, by the perusal of a Manuscript Catalogue of the Plants cultivated in that Garden, in which there is no mention made of this Plant.

The *Lychnis*, which grows on *Nottingham-Castle*, is the *Lychnis sylvestris alba* 9 *Clusii*, and not the same with Mr. Ray's *Lychnis major noctiflora Dubrensis perennis*, as he suspected.

Festuca humilior panicula brevi heteromalla. Gramen paniculatum, bromoides, minus, paniculis aristatis, unam partem spectantibus Raii Syn. On *Sherwood Forest*.

Salix folio laureo, seu lato glabro odorato Phyt. Brit. Common about *Wingerworth*.

Ladanium arvense, flore amplo luteo; labro purpureo. Lamium cannabinum, flore amplo luteo, labio purpureo Raii Syn. In the Corn in several Places.

Filix mas non ramosa, pinnulis angustis, raris, profunde dentatis Ger. emac. Common about *Wingerworth*.

The *Peak* is famous for seven Places, which have been dignified by our Ancestors, with the Name of Wonders: 1. *Chatsworth*, a magnificent Seat of his Grace the Duke of *Devonshire*; 2. *Mam-tor*; 3. *Elden-hole*; 4. *The ebbing and flowing Well*; 5. *Bux-*

5. *Buxton-Well* ; 6. *Peak's Hole*, and 7. *Pool's Hole*. The First being a Work, not of Nature, but Art, does not come within the Design of this Account. *Mam-tor* is a huge Precipice facing the East, or South-East ; which is said to be perpetually shivering and throwing down great Stones on a smaller Mountain below it ; and that nevertheless, neither the one increases, nor the other decreases in Bigness. This Mountain is composed chiefly of a Sort of Slate-Stone (called in that Country *Black Shale*) and great Stone. The Nature of the *Black Shale* is known to be, that notwithstanding it is very hard before it is exposed to the Air ; yet it is afterwards very easily crumbled to Dust. Thus on any Storm, or melting of Snow, this Shale is considerably wasted ; and as the great Stones are gradually disengaged, they must necessarily fall down. That it is only at these Times that the Mountain wastes, is affirmed by the most intelligent of the neighbouring Inhabitants : And that this Decay is not perpetual, I can affirm myself ; having not only taken a close Survey of it, but also climbed up the very Precipice, without seeing any other shivering in the Mountain, than what the treading of my own Feet in the loose crumbled Earth occasioned. That the Mountain does not decrease in the mean Time, is a Tale too frivolous to need any Consideration.

Elden-hole, is a huge perpendicular Chasm. The Depth of it is not known. Mr. *Cotton* tells us, that he founded 884 Yards, and yet the Plummet drew. But he might easily be deceived, unless his Plummet was of a very great Weight ; for otherwise, I imagine
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the Weight of a Rope of that Length, would be so great as to make the Landing of the Plummets scarce perceivable. Be that as it will, the Depth of it is to be sure very considerable; and considering that we have no where in *England* so good an Opportunity of searching the Bowels of the Earth to so great a Depth; I wonder no curious Person has ever had the Courage to venture down. It is said indeed, that a poor Fellow was hired to be let down with a Rope about his Middle, two hundred Yards; and that he was drawn up again, out of his Senses, and died a few Days after: And no Wonder, for the poor Wretch having nothing else to reflect on in that dismal Place, but the Danger he had put himself into for the Sake of a little Money, might probably be fright'ned out of his Senses. Or indeed the very Fatigue itself might put him into that Condition; as any one will easily imagine, who has been let down but a quarter of the Way, and drawn up again in that Manner. But I conceive, that if any intelligent and prudent Person was to be let down in a proper Machine; he would not be much in Danger, and his Fatigue would be very inconsiderable.

The *ebbing and flowing Well* is far from being regular, as some have pretended. It is very seldom seen by the Neighbours themselves; and, for my Part, I waited a good while at it to no Purpose: And so I shall pass it over in Silence.

Buxton-Well has been esteemed a Wonder, on account of two Springs, one warm and the other cold, rising near each other. But the Wonder is now lost, both being blended together. The Spring

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which

which is now used for bathing, appears to be $32\frac{1}{2}$ Degrees of one of Mr. *Hawksbee's* Thermometers warmer than the common spring Water there*. Statical Experiments on the Effects of warm bathing having been seldom made, I hope a few, which I had an Opportunity of making, will not be unacceptable.

		Weight. lb. 3.	After bathing 12 Minutes.	Urine.	
<i>July 21.</i> 1728. h. 10 $\frac{1}{2}$ at Night.	A.	137 12	137 11 $\frac{1}{2}$	3 3	
	B.	134 15 $\frac{1}{2}$	134 13 $\frac{1}{2}$		
	C.	169 15	170 —		
	D.	119 6 $\frac{1}{2}$	119 7	4 3	
			Urine. 3.	Weight after 1. h.	after bath. 20 Min.
22 h. 8 $\frac{1}{2}$ Morning.	A.	136 9	9 $\frac{1}{2}$	135 15	136 —
	B.	134 1	7	133 7	133 11
	C.	168 13	13	167 11	167 14
	D.	118	15	117 —	117 —
h. 11. after eat. Cloaths changed.	A.	137 5	} After h. 1 $\frac{1}{2}$ } } Exercise chief- } } ly un. Ground } } in <i>Pool's Hole</i> . }	1	Perfp. 10 $\frac{1}{2}$ 3
	B.	140 7			13 3
	C.	170 4 $\frac{1}{2}$			— lb
	D.	117 8			8 $\frac{1}{2}$ 3
Aft. Din. Cloaths changed.	A.	lb 3	3	Perspiration in 1 $\frac{1}{2}$ h. where note, that all used moderate Exercise, walk- ing about, except D, who fate still reading the whole time.	
	B.	136 14	3		
	C.	142 6 $\frac{1}{2}$	7 $\frac{1}{2}$		
	D.	170 15	3		
	D.	119 1	6 $\frac{1}{2}$		

* The Spring Water kept the Spirit of Wine at 41, the Bath Water raised it to 8 $\frac{1}{2}$.

Servant who at- tended the Bath.	Weight.	Aft. 1 h. bath.	Aft. 1. h. Persp.
	lb 3 173 4	lb 3 173 6	lb 3 172 15

From these Experiments may be concluded,
1st, That warm bathing increases the Weight of the Body for the present ; though it causes a plentiful Perspiration afterwards: Which I do not remember that any one has hitherto observed.

2^{dly}, That the Perspiration after this Exercise is nothing near so large as Dr. *Keill* * has delivered ; it amounting by his Account to one Pound and a half in one Hour's Time. By our Observation it is but five Ounces in one Hour, and from eight Ounces and half to one Pound, in one Hour and a half, though assisted by Motion ; which might have caused us to perspire (by Dr. *Keill*'s Computation†) from three to 8 Ounces.

Peak's Hole and *Pool's Hole* are two remarkable horizontal Openings under Mountains, the one near *Caton*, the other just by *Buxton*. They seem to me have owed their Original to the Springs which have their Current through them. It is easy to imagine it when the Water had forced it's Way through the horizontal Fissures of the *Strata*, and had carried the loose Earth away with it, the loose Stones must of

Med. Stat. p. 16.

Calore, motu & exercitio uncia 2 vel 3 interdum 4 perspiratione unius horæ expelluntur. Med. Stat. p. 15.

Course fall down ; and that where the *Strata* had few or no Fissures, they remained entire, and so formed those very irregular Arches which are so much wondered at in these Places. Whether this be the true Origine of these Caves or not, I submit to those who shall hereafter have the Curiosity to examine. It seems more probable to me, than what others have hitherto proposed. The three Rivers, as they are commonly called, in *Peak's-Hole* are only some Parts of the Cave deeper than the rest, and receiving all their Water from the Spring which comes from the farther End of the Cave. The Water which passes through *Pool's-hole* is impregnated with Particles of Limestone, and so has incruited almost the whole Cave in such a Manner, that it appears like one solid Rock.

The more rare Plants which I observed in the *Peak* are,

Scariola sylvestris Anguillareæ. Lactuca sylv. murorum flore luteo J. B. On old Walls and about the Entrance into *Peak's-hole*. It grows also in *Hertfordshire*. I choose to take Notice of it on this Occasion, the rather because *M. Vaillant* has evidently mistaken the Characters of it in his new Distribution of the *Cichoraceous Tribe* in the *Memoirs of the Royal Academy of Sciences* for the Year 1721. He there makes it a Species of *Lactuca*, from which it is very different on his own Principles. According to his Method, the *Empalement* of the *Lactuca* is *squamous*, and the *Down* of the Seed sits upon a *Pedicle*. But this Species has a *simple Empalement* and a *sessile Down*. These Characters evidently distinguish it not only from *Lactuca*, but from every Genus in his Method. I shall take leave therefore to constitute a new Genus :

And as the Name of *Scariola*, by which *Anguillara* has called it, has not yet been appropriated to any other Genus, I shall appropriate it to this, and define it, as follows.

Scariola is a *Cichoraceous Plant*, with a *simple Empalement*, a *naked Placenta*, and *Seeds* crowned with a *hairy sessile Down*.

Rosa sylv. alba cum aliquo rubore foliis hirsutis *J. B.* In several Hedges about *Hathersedge*.

Empetrum montanum fructu nigro *Tourn.* Common on the Mountains.

Oxycoccus, seu Vaccinia palustris, J. B. On boggy Places, but not very common.

Erica humilis cortice cinereo Arbuti flore albo, H. R. Par. On the Mountains near *Hathersedge*.

Rubus Idæus spinosus fructu rubro, J. B. In the Hedges.

Geranium saxatile *Ger. emac.* About the Entrance into *Peak's-hole*.

Cochlearia rotundifolia minima *Merr.* With the preceeding.

Thalictrum minus *Ger.* In the same Place.

Lichenoides saxatile, fuscum, pilosum, varie divisum. Corallina fusca foliosa *Doody Budd. Hort. succ.* On the Rocks.

Lichenoides saxatile tinctorium foliis pilosis purpureis Dillenii. On the Rocks.

Usnea saxatilis, capillacea. Muscus corallinus, saxatilis, fœniculaceus Raii *Syn.* On the Rocks near *Darwent*.

Lycopodium Sabinae facie *Fl. Jen.* On the Mountains near *Darwent*.

Selago foliis & facie Abietis Fl. Jen. On the Mountains near *Darwent*.

Bryum Hypnoides capitulis, plurimis erectis lanuginosum Dillenii. On the Mountains.

Cardamine impatiens altera hirsutior Raii Syn. About the Mouth of *Pool's-hole* plentifully.

A Variety of Mr. Ray's *Viola montana lutea* with a blue and yellow Flower.

The *Lead-mines* in *Derbyshire* are very various with regard to their Courses. One into which I went down, had two Branches ; one running to the N. E. the other to the N. W. And as I was informed, one of the best they ever discovered ran due North. Their Breadth and Depth are full as irregular. The Bodies through which they dig to come at the Vein are generally *Limestone* and *Black Shale*. But it is uncertain which of the two is uppermost. Of two Mines into which I went down, in one they had dug first through 26 Yards of *Limestone*, then through one of *Black Shale* : In the other first through 42 Yards of *Shale*, and then through 28 of *Limestone*. The Substances which they find mixt with the *Ore*, are

1. *Chert*. This is a kind of *Flint*, which Dr. Woodward* says is called so, when it is found in thin *Strata*. But in the *Peak* the *Strata* of *Chert* are often four Yards thick, or thicker. They are found in *Limestone*, and not always disposed in *Strata*. Those which I took Notice of were generally either black, or of such a Colour as the inspissated Juice of the *Buckthorn* Berries, which the Painters call by the Name of *Sap-green* : Whence they are called *Green Cherts* and *Black Cherts*.

* Method of Fossils, p. 21.

2. *Spar.*

2. *Spar*. This is compos'd of *Cryſtal* mixt with other Bodies. Thoſe which they call *Sugar-ſpars*, are thoſe whoſe Cryſtallifications are very ſmall, and ſo on crumbling to Pieces have the Appearance of powdered Sugar. I have two Sorts of theſe; white and blue. *Dog-tooth Spar* is a white pointed Spar, in Form and Colour ſomething reſembling Teeth.

3. *Cauk*. This Dr. Woodward * ſays is a coarſe talky Spar. But in that Subſtance which I met with in this Country under the Name of *Cauk*; I could not diſcover any Flexibility or Elasticity, which that learned Writer has ſet down as Characteriſticks of *Talk* and *Talky Bodies*. † It ſeems to me to be nothing but *Spar* incorporated with a coarſe earthy Matter. When this *Cauk* is mixt with pellucid Cryſtallifications of *Spar*, it is called Baſtard Cauk.

There are ſeveral other Bodies mixt in the Mines with *Lead-ore*: But as they did not occur in thoſe Mines which I examined, I ſhall omit the Mention of them.

When the *Ore* is brought up from the Mine it is broken to Pieces that the *Spar*, *Cauk*, or other Bodies which adher'd to it may be the more eaſily ſeparated: It is then thrown into a large Sieve and waſhed, and ſo farther purified from extraneous Bodies. After this, it is carried to the Furnace in order to be ſmelted. The Furnace, which I ſaw near *Workſworth*, was very rude and ſimple, conſiſting only of ſome large rough Stones, placed in ſuch a Manner as to form a ſquare Cavity, into which the Ore and Coals are thrown *ſtratum ſuper ſtratum*; two great Bellows continually blowing the Fire, being moved alternately by Water. I ſaw

* Method of Fossils, p. 18.

† Catalogue of Fossils, Vol. i. part i. p. 57.

no other Fuel used on this Occasion but dried Sticks, which they call white Coal. * Mr. Ray informs us, that they use both white and black Coal or Charcoal in *Cardiganshire*. I suppose because that Ore is harder to flux ; the Charcoal making a more vehement Fire. They generally throw in some Spar along with the Ore, which is thought by imbibing the Sulphur to make it flux more easily. They frequently throw in also some Cowke (or Cinders of Pit-coal) because they think it attracts the Dross, and so makes an easier Separation of it from the Lead. When the Ore is melted, it runs out at an Opening in the Bottom Part of the Front of the Furnace, through a small Channel made for that Purpose, into a cylindrical Vessel, out of which it is laded into the Mould. The Dross of the Ore on smelting is called *Slag*. This *Slag* is afterwards smelted again with Cowke only, and the Lead obtained from it is called *Slag-lead*. Their Way of making *Red-lead* is the same with † Mr. Ray's Account ; only they use three Parts of Lead, and one of *Slag-lead* ; and think that the *Red-lead* made thus is better than if made without *Slag-lead*.

* Collection of *English Words*, Ed. 2. p. 174.

† Ibid. p. 200.